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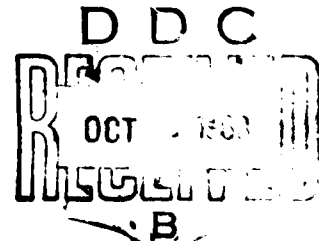
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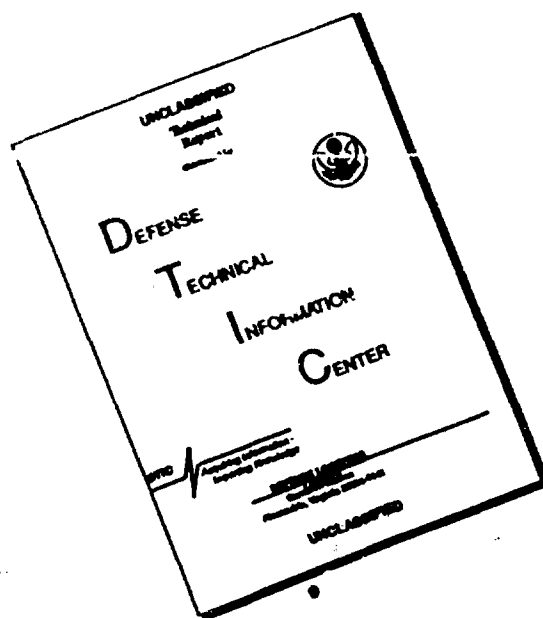


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DIAGNOSIS OF A LOCAL FORM OF ANTHRAX IN SWINE

[Following is the translation of an article by N.G. Ipatenko, Senior Veterinarian, Directorate of Specialized State Farms, RSFSR Ministry of Agriculture, published in the Russian-language periodical Svinovodstvo (Swine Breeding), 14:40-43, 1930. Translation performed by Sp/7 Charles T. Gierke, Jr.]

Following the discovery of the anthrax causative agent, for a comparatively long time many scientists considered that swine were not susceptible to this causative agent and therefore did not become ill with anthrax.

Only in the nineties of the last century a Russian scientist, Chernogorov, by means of the artificial introduction of large doses of an infected source, was able to cause anthrax with a lethal outcome in swine, and by this prove the inaccuracy of the original views on the nonsusceptibility of swine to this infection.

Considerably later the German scientists Elzesser and Zibel, by means of experimental investigations, confirmed the correctness of Chernogorov's views.

By this time several cases of the natural infection of swine with anthrax had already been recorded.

When the question of the susceptibility of swine to anthrax infection was substantiated, discord emerged among scientists in connection with the most widely disseminated form of the disease among swine.

The controversy was which of the forms of anthrax is encountered most often - local or septic? An idea as to what extent the local form of anthrax is encountered among swine can be gathered on the basis of numerous investigations. For example, the Russian scientist A. V. Katagoshchin observed 67 cases of anthrax in swine. Out of all the sick pigs only in one did he observe general anthrax sepsis and in 4 the intestines were affected. In the remaining 62 cases (92.5%) the anthrax process was limited to the area of the mouth, that is the submaxillary lymph nodes were affected. In his works the German scientist Maag describes 154 cases of the local form of anthrax in swine with a localization of the process in the area of the mouth, and only in 3 cases did he observe a sclerotic coloring of the fatty tissue with the isolation of an anthrax culture.

Based on the data of D. M. Teternik, in 1936 at the Moscow Meat Combine 150 cases of anthrax in swine were recorded. Of these in 142 cases they established a localization of the anthrax process in the area of the pharynx with affliction of the tonsils and submaxillary lymph

nodes, and only in 8 cases was a general septic process observed. Later L. S. Nevskiy in his paper described 50 cases of the local form of anthrax. In 47 of these he observed a one-sided affliction of the sub-maxillary lymph nodes and in 3 cases - two-sided.

The fact that the local form of anthrax is encountered much more often than the septic was also supported by us jointly with the Chinese veterinary specialists Doctor Li and Doctor Su at the Shanghai Meat Processing Plant. Over a period of two years (1954-1956) 176 cases of the local form of anthrax were established there.

From 1956 through 1959 we investigated more than 30 meat processing plants in the Russian Federation and established 103 cases of the local form of anthrax among slaughtered swine.

While among the swine mainly the local form of anthrax was spread, the question arose, which lymph nodes and organs were most subjected to this disease.

From our observations the conclusion could be made that it is mainly the lymph nodes of the head which are afflicted. Only in 7 cases were other organs afflicted (5 cases - mesenteric lymph nodes and in 2 cases - the spleen).

The inadequate statistical reflection of this disease in swine is explained by the difficulty in diagnosing the local form of anthrax.

This latter should be watched for by veterinarians and all persons connected with hog production and slaughter, since doubtlessly there is danger of encountering an unidentified form of anthrax in these animals and to permit the spreading of the infection if the disease is not exposed in time and the source of infection is not destroyed.

It is adequate to slaughter a pig, afflicted with a local form of anthrax, and on the force of scanty information or inexperience to retain the unnoticed presence of a focus of the disease, as meat carcasses can easily become inseminated with anthrax and they may be a dangerous source of infection for users of the meat and workers at hog farms, slaughter houses and meat processing plants.

Anthrax in swine cannot be viewed without connecting it with this infection in other species of domestic animals.

Swine may become infected with anthrax as a result of their eating infected meat - the carcasses of killed animals or animals which had died from anthrax. Here infection sets in only in the case of traumatization of the mucous membrane in the oral cavity of the pig. Pigs, as omnivorous animals digging in the ground, are subjected to the danger of infection with soil anthrax moreso than other animals.

Following the autopsy of the carcasses of animals, particularly horned cattle, sheep and horses which had died from anthrax, no doubts arise as to the true nature of the illness. A completely different picture is observed when swine are slaughtered for meat and they are infected with a chronic local form of anthrax. In these cases those pathological changes which are characteristic for anthrax, such as enlargement of the spleen, thick non-coagulating blood, hyperemia, etc., may be lacking completely. This is fully understandable, since with such a form of illness in pigs the process takes place locally, the bacilli either do not penetrate into the general blood stream at all, or are manifested in a very limited amount (they are mainly restrained by the lymph nodes), and the process localized in the submaxillary, retropharyngeal and cervical lymph nodes. With this form of the disease the general condition and body temperature of the pig may be normal, in appearance they seem healthy and only very rarely is a swelling in the area of the neck and labored breathing noticed. Therefore, if during the pre-slaughtering examination a small edema is not observed around the neck or if it is localized in the internal organs, then such an anthrax animal may be permitted for slaughtering and subsequently used as a food product.

In order to help the workers at pig farms, slaughter houses and meat plants to avoid similar errors and to ease the diagnosis of local forms of anthrax in swine, we will give a brief description of several interesting cases of detecting this disease in slaughtered pigs which we encountered in our practice.

CASE 1. During the examination of the submaxillary lymph nodes of a carcass after bleeding it was revealed that the right submaxillary lymph node was enlarged by 4-5 times. In a section its surface was a brick-red color and in the depth of the section an anthrax focus was detected. It was a dark cherry color and was a little larger than the head of a pin.

The lymph node itself and the connective tissue adjoining it were saturated with exudate. The remaining lymph nodes and the parenchymatous organs turned out to be normal.

Anthrax bacilli were detected by means of seeding the contents from the focus of affliction of the lymph node and the infection of laboratory animals.

CASE 2. During the examination of the lymph nodes and parenchymatous organs in a carcass it was established that the spleen was considerably enlarged in size and distributed on its surface were infarcts of a dark cherry color. In size they ranged from that of a pea to a pigeon egg. By the seeding method anthrax bacilli were found in the contents of the infarcts.

This was also confirmed by the infection of laboratory animals: Six mice, infected with the contents from the infarcts, died from anthrax in 18-24 hours, and six mice, which received the contents from a normal part of the spleen, remained alive. Consequently, the anthrax process was localized at the sites of the infarcts, that is, a local form of anthrax was present. The remaining lymph nodes and the parenchymatous organs of that carcass turned out to be normal.

CASE 3. During the examination of the lymph nodes and the parenchymatous organs of the carcass it was revealed that the tonsils were injured (two-sided focal necrosis), the pseudomembrane was of a yellow color and there was present a large amount of exudate of a yellow-gray color which gave off an unpleasant odor.

By means of seeding on nutrient media and infection of laboratory animals it was established that anthrax bacilli were present in the foci of affliction of the tonsils.

The remaining lymph nodes and the parenchymatous organs of this carcass turned out to be normal.

CASE 4. During the examination of the lymph nodes and the parenchymatous organs of the carcass it was ascertained that the mesenteric lymph node was enlarged by 6-8 times. The surface of a section was of a brick-red color with sharply expressed hemorrhages of a dark cherry color.

The mucous membrane of the small intestine was swollen, hyperemic, covered with ulcers or nodules the size of a kopeck and with a dark cherry color; to the right and to the left from the center of affection the small intestine was covered with a viscous exudate and punctate hemorrhages, and in the very center of the affection the mucosa of the small intestine was gathered up into a fold or bellows. This case was a very strongly expressed inflammation of that sector of the small intestine with injury to the intestinal villi (diphtheria of the villi). In the abdominal cavity we found a jelly exudate and yellow clots of fibrin in the form of threads between the loops of the intestine. The vessels of the mesentery on the affected sector of the intestine were strongly initiated, the mesentery itself was gelatinously infiltrated and permeated with hemorrhages.

During the microscopic investigation of smears from injured nodules of the small intestine the presence was established of morphologically changed gram positive anthrax bacilli.

An extract from the injured nodules of the small intestine was used to infect two white mice, which died from anthrax in 70-86 hours after infection.

The remaining lymph nodes and the parenchymatous organs of that carcass proved to be normal.

These and other investigations confirm that anthrax in swine is localized primarily in the lymph nodes of the head and in the mesenteric lymph nodes, that is, locally.

This infection is rarely observed in the acute and septic form, and conversely often in the chronic local form without the spreading of the process even to the neighboring tissues. The local forms of anthrax in swine often terminate in recovery and the complete healing of the anthrax foci.

In view of the comparatively frequent localization of chronic anthrax in the submaxillary and cervical lymph nodes of swine it is necessary to perform the autopsy and examination of these lymph nodes immediately after the bleeding of the carcass.

During the chronic local form of anthrax we did not find either edemas of the larynx or deposits on its mucous membrane. Most often of all the injury was to one of the submaxillary, retropharyngeal, parotid and cervical lymph nodes. Such a node is often enlarged and has a brick-red color in a cross section. Enlargement of the lymph nodes by 2-4, and sometimes 8-10 and more times is not obligatory, since the enlargement of glands may be insignificant. Most often the process does not encompass the whole node, but an individual lobe of it, and sometimes the injury is the size of a pin head or a pea.

Together with the typical forms of anthrax bacilli, microscopic investigations of smears from infected sectors of the lymph node revealed involute forms of it in the shape of threads, commas, inflated bacilli, etc.

From the point of view of differential diagnosis it is important to keep in mind that in anthrax the cross section of the lymph nodes is usually a uniformly red color and on the surface there frequently are diffuse hemorrhages of a dark cherry color, while in swine plague flabbiness and marble-like are characteristic for the lymph nodes.

In pigs the intestinal form of anthrax is observed rarely. Then the mucous membrane of the small intestine in the focus of affection is hemorrhagically or necrotically diphtheroidly inflamed. In such cases the spleen remains unchanged and only sometimes is enlarged insignificantly.

For the purpose of clearing up the pathogenesis of the local form of anthrax in swine we carried out experimental investigations on the artificial infection of swine with anthrax.

We worked with 14 pigs, weighing from 60 to 100 kilograms, and ranging in age from 8 to 12 months.

For the infection we used a strain, isolated from a pig affected with a local form of anthrax.

A 24-hour broth culture of this strain in a dose of 0.1 ml killed mice in 16-18 hours. Pigs No. 1, No. 2, and No. 3 were infected with a spore form of this strain, washed from an agar culture and included in a gelatinous capsule. Ten such capsules were introduced into the oral cavity of each of the three test animals.

Pigs No. 5, No. 11 and No. 13 endured a strong trauma of the mucous membrane of the oral cavity prior to infection, and Pigs No. 4, No. 6, No. 7, and No. 8 - a slight trauma and were fed spores with their feed. Using a syringe we introduced a 24-hour culture of anthrax in a dose of 0.5 ml into the submaxillary space of Pigs No. 9 and No. 10. Using a brush we rubbed spores into the mucous membrane of the oral cavity of Pigs No. 12 and No. 14.

All the test animals were sacrificed in 14-30 days after infection. During a complex bacteriological investigation it was established that Pigs No. 5, No. 11, No. 13, No. 9, and No. 10, which received the contaminated source through a strongly damaged mucous membrane, had a local form of anthrax with damage to various lymph nodes of the head. Investigation of the remaining animals yielded a negative result.

The cited test makes it possible to draw a preliminary conclusion that infection of the pigs sets in if there is a strong disruption of the mucous membrane of the oral cavity.

Detection of anthrax in pigs during examination at slaughter houses and at meat plants is possible only with an autopsy and investigation of the pharynx, larynx, the submaxillary retropharyngeal and the group of cervical lymph nodes, and also the lymph nodes of the intestine. It is particularly important to carefully examine the lymph nodes of the mesentery and the parenchymatous organs.